



THE UNIVERSITY *of* EDINBURGH

## Edinburgh Research Explorer

### Finance, property rights and productivity in Italian cooperatives

**Citation for published version:**

George, D, Fontanari, E & Tortia, EC 2019 'Finance, property rights and productivity in Italian cooperatives' Edinburgh School of Economics Discussion Paper Series.

**Link:**

[Link to publication record in Edinburgh Research Explorer](#)

**Document Version:**

Publisher's PDF, also known as Version of record

**General rights**

Copyright for the publications made accessible via the Edinburgh Research Explorer is retained by the author(s) and / or other copyright owners and it is a condition of accessing these publications that users recognise and abide by the legal requirements associated with these rights.

**Take down policy**

The University of Edinburgh has made every reasonable effort to ensure that Edinburgh Research Explorer content complies with UK legislation. If you believe that the public display of this file breaches copyright please contact [openaccess@ed.ac.uk](mailto:openaccess@ed.ac.uk) providing details, and we will remove access to the work immediately and investigate your claim.





Edinburgh School of Economics  
**Discussion Paper Series**  
Number 293

*Finance, property rights and productivity in Italian cooperatives*

**Donald A R George**  
(University of Edinburgh)

**Eddi Fontanari**  
(EURICSE, Italy)

**Ermanno Celeste Tortia**  
(University of Trento)

Date  
November 2019

***Published by***

School of Economics  
University of Edinburgh  
30 -31 Buccleuch Place  
Edinburgh EH8 9JT  
+44 (0)131 650 8361  
<http://edin.ac/16ja6A6>



THE UNIVERSITY *of* EDINBURGH

# Finance, property rights and productivity in Italian cooperatives

Donald A R George, *University of Edinburgh, UK*

Eddi Fontanari, *EURICSE, Italy*

Ermanno Celeste Tortia, *University of Trento, Italy*

“The form of association ... which if mankind continue to improve, must be expected in the end to predominate, is not that which can exist with capitalist as chief, and workpeople without a voice in the management, but the association of the labourers themselves on terms of equality, collectively owning the capital with which they carry on their operations, and working under managers elected and removable by themselves.”

John Stuart Mill, *Principles of Political Economy*, 1848

## 1 Introduction

The empirical evidence, see e.g. Fakhfakh, Perotin, & Gago (2012), suggests that workers' cooperatives are at least as productive as their capitalist counterparts, and their members report a high quality of working life. However, cooperatives account for only 3% - 6% of GDP in most market economies. In such economies there is apparently nothing to stop workers forming a cooperative if they believed it would offer benefits superior to those available in a conventional capitalist firm. It is therefore of interest to investigate the factors, peculiar to cooperatives, which determine their productivity. This should help to explain the relative paucity of cooperatives in the market economies, and inform policy towards them.

Some of these issues are investigated empirically by Jones and Backus (1977), Gagliardi (2009), Pencavel, Pistaferri and Schivardi (2006), Estrin and Jones (1992) and George (1993a), but all five sources use datasets significantly less comprehensive than ours. Fakhfakh, Perotin and Gago (2012) is one of the few contributions that have tested productivity in cooperatives in a systematic way.

## 2 Summary of Theory

The standard economic theory of cooperatives is the Ward/Vanek/Meade income per worker maximising model (Ward, 1958), (Vanek, 1970), (Meade, 1986). In its simplest version the model assumes full capital-renting (equivalent to full external finance). This assumption is clearly unrealistic, and the analysis of finance for the self-managed firm must clearly go beyond the simplifying assumption of full external finance, a topic which has generated a great deal of

controversy: see, for example, Dow (2018). Given the necessity to accumulate internal funds (owned patrimony) to build collateral guarantees towards external financiers, it is necessary to study how real world cooperative enterprises do accumulate owned capital, and the related limitations to this process. Well-known results concerning the undercapitalization hypothesis state that when the ownership of capital is socialized (this applied to public ownership, social ownership and common ownership) worker cooperatives are likely to under-invest and produce at a too small scale, that is with increasing returns to scale (Furubotn and Pejovich, 1970; Vanek, 1970). Given these premises, the three critical issues, for the purpose of this paper, are: the Furubotn-Pejovich and the Vanek effects, and risk sharing in worker cooperatives.

## 2.1 The Furubotn–Pejovich and Vanek effects

Furubotn and Pejovich, initially in 1970, have repeatedly argued that cooperatives are fatally flawed by their failure to allocate property rights appropriately. This approach forms the nucleus of what has come to be known as the ‘Texas school’. In particular, Furubotn and Pejovich (1970) have argued that the collective nature of property rights in a cooperative’s capital will induce it to under-invest. In taking investment decisions in a cooperative, members will be influenced by the fact that they may leave the firm during the economic lifetime of newly acquired capital. Since this capital is collectively owned, such members would not be able to recoup ‘their part’ of the principal and would forgo some of the returns. Cooperatives cannot issue shares to outside shareholders because this would transfer some of the right to manage to these shareholders, and the firm would cease to be fully controlled by its members. Moreover, in most national contexts, there is no market in membership rights, even if several projects have been put forward to accomplish it (for a wide review of this literature and new proposals, see Dow, 2018). Markets for membership rights are absent in the Italian context.

Under these circumstances, the members’ “truncated temporal horizon” results in investment rationing and inefficient allocation of capital funds (Tortia, 2007). The internal rate of return required for the investment to take place is biased upwards when compared to the efficient rate (the market rate). The level of investment is correspondingly biased downwards, thus engendering under-capitalization. The horizon effect is especially severe in the case of long term and not highly remunerative investments, since this kind of asset depreciates over spans of time that are much longer than the typical tenure of worker-members in co-operatives. Correspondingly, worker cooperatives are very rarely observed, or completely absent in industrial sectors characterised by high capital intensity and long run duration of investments (e.g. utilities). The horizon effect can be

severe also when the members' median age increases and newcomers are smaller in numbers than quitting or retiring members, since in this case the median horizon shrinks.<sup>1</sup> On the other hand, it must be said that increasing median age can be a normal occurrence in declining industries, in which case declining investments may not be considered as inefficient. This is so because declining industries are characterised by declining investment and job creation rates, implying that the median age of the incumbent workforce would tend to increase, holding all other conditions constant. Empirically, it is difficult to determine whether the internal rate of return on cooperative investments is inefficient, that is higher than the market (efficient) interest rate. However, it is possible to determine if co-operatives produce at increasing returns to scale.

Vanek (1977) put forward a different but related argument. He argued that, under internal financing, cooperatives will not pay a scarcity-reflecting rent for the use of capital, thus changing their maximand. He shows that this will lead to the firm operating at an inefficiently low scale. Figure 1 depicts equilibrium outcomes for external and internal financing, assuming both Furubotn–Pejovich and Vanek effects at work. They lead the cooperative to operate (in the long run) at too low a capital/labour ratio and too low a scale (see figure 1). This is Pareto-inefficient and would mean the cooperative losing a competition with a conventional, profit-maximising firm in possession of the same production function (the cooperative's "capitalist twin"). Full external finance would cause both the scale effect and the capital intensity effect to disappear, but cooperatives cannot use external equity finance, because that would dilute members' control rights.<sup>2</sup> In the presence of full external finance, worker members would not participate in financial risks inherent to the business venture (they would not contribute any collateral guarantee to their debts). Once lenders understand the high level of risk they would incur in financing the co-operative, they would withdraw their financial support, leaving cooperative members to bear capital risks in addition to risks associated with employment, a situation often unfavourably compared with the allegedly efficient allocation of risk under capitalism. In addition to this, there remains the problem of 'increasing risk'. Even though bonds carry a fixed and certain rate of interest, there remains the possibility of default, and the probability of the lender suffering a loss increases as the proportion of equity capital in the financial structure decreases. The lender, therefore, demands a higher rate of

---

<sup>1</sup> This latter condition may not be problematic in declining industries and sectors, in which the disappearance of existing organizations can be a normal occurrence (Tortia, 2018).

<sup>2</sup> Several proposals have been put forward for implementing quasi share financial instruments, but they will not be treated in this paper. See for example 'risk participation bonds' (McCain 1977), 'variable income debentures' (Vanek 1977), 'non-voting, residual value added renewables shares' (Major, 1996) and (George (1993b))

return and the cost of bond-financed capital rises at the margin (MaCain, 1977; Schlicht, and von Weizsäcker, 1977, Jensen and Meckling, 1979, Ellerman, 1986; van der Weerden, 2016). The problem of ‘increasing risk’ would lead to insufficient external finance, forcing worker members to intervene with their own financial resources or to have the cooperative under-capitalized. Finally, a fixed commitment to interest and principal repayments gears the risk to residual claimants, who in a co-operative are its members, thus reducing their willingness to undertake further borrowing.

Collective property rights, for example in the form of indivisible reserves of capital not recoupable by members both during the life and upon the dissolution of the co-operative, wherein indivisible reserves are owned by the co-operative itself and not by individual members, run the risk of generating the Furubotn-Pejovich and Vanek effects. However, by creating resources owned by the co-operative<sup>3</sup> (serving the function of investment finance, collateral guarantee for borrowing and insurance funds in favour of cooperative members), they can fruitfully mitigate increasing risk, that is increasing cost of capital and unwillingness of external financiers to lend. The net effect of these two opposing forces (undercapitalization and increased patrimonial stability) cannot be ex ante determined. It depends on several factors, including, but not limited to, the temporal horizon (Tortia, 2018). For example, the net effect depends on the increased potential for the cooperative to preserve its owned resources (both human and non-human) in negative economic contingencies, and to renew its membership by progressively including younger members (thus weakening the constraint represented by the truncated temporal horizon).

Empirical research has a fundamental role in disentangling theoretical limitations and contrasting conclusions. From this point of view, comparative analysis at the national level appears to be especially fruitful. Econometric results published in the study including the analysis of French data by Fakhfakh, Perotin and Gago (2012) use French national data and a translog specification of the production function. French worker cooperatives are less capitalized than capitalist enterprises, but only in some specific sectors (capital goods, transport and consumer services), while in all other sectors the level of capitalization is similar in the two types of firm. The authors show that worker cooperatives do not operate at a too low scale of production, even if they are most likely to operate at constant returns to scale, while capitalist enterprises operate at decreasing returns to scale. Furthermore, this study also shows that cooperatives are no less productive than capitalist enterprises, even if the two types of firms use different technologies, that is different mixes of the labour and capital factors. Another study carried out in Italy on financial statements of Italian

---

<sup>3</sup> In Italian cooperatives, the incidence of collective reserves on equity is around 86% (Fontanari and Borzaga, 2018).

cooperatives and investor-owned firms (IOFs) provides some interesting insights (Fontanari, 2018). In fact, this study highlights the fact that Italian cooperatives enjoy a higher leverage effect than their capitalist twins. This is the proof that, on one hand, cooperatives are able to adequately exploit external financing and, on the other, that banks consider them bankable. In addition, another important aspect concerns the ability of cooperatives to generate a capital turnover higher than that of investor-owned firms. This condition assures adequate levels of liquidity in cooperatives – i.e. not lower than those shown by investor owned firms (IOFs) – thanks to the labour-intensive nature of activities usually undertaken by cooperatives. In fact, this peculiarity implies, in turn, a lower relevance of fixed assets and an ability to generate a higher level of revenues per unit of invested capital. In this regard, it is possible to understand that the level of equity needed for undertaking a productive activity has to be connected to the nature of that activity, which can be more or less capital or labour-intensive. The level of equity has to be commensurate with the long-term optimal capitalization level in a specific sector, while at the same time different firm types can achieve efficient production by using different factor mixes (more or less capital intensive).

Especially under-researched are the specific effects of the presence of collective or non-divided ownership on productivity. The Fakhfakh, Perotin and Gago (2012) study considers the total effects on productivity of capitalization in French co-operatives, but it does not single out the specific effect of the presence of collective reserves, even if the authors themselves state that a large portion of surpluses in French co-ops is reinvested into non-divided reserves of capital.<sup>4</sup> The lack of high-powered financial incentives (e.g. as created by share-ownership, profit sharing and employee stock ownership) would lead one to presume that collective ownership decreases productivity. On the other hand, patrimonial stability may be a positive feature of collective ownership, since the capital of the enterprise cannot be shared and distribution of dividends is limited and strongly regulated by law, while the greatest part of positive net residuals is reinvested into indivisible reserves (Tortia, 2007). These institutional constraints force the creation of collective funds that can have an insurance function against the risk of lay-off and unemployment, and that can favour the preservation of the stock of human capital of the organization during downturns of demand (Tortia, 2018). Cooperatives may be able to internalize worker-specific effects that are not internalized optimally in capitalist enterprises. Especially, these effects are related to limited information, contrasting interests and optimal accumulation of human capital. While the role of

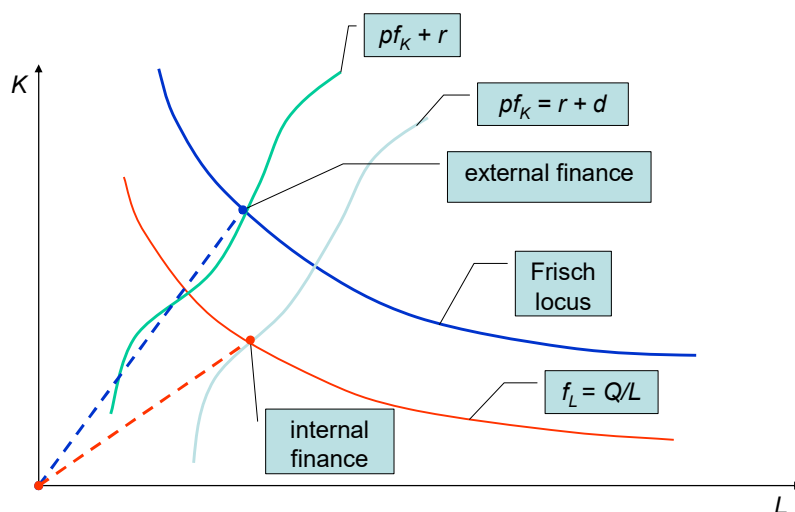
---

<sup>4</sup> The minimum legally required annual plowback in French worker co-ops (SCOPS) is 25% of profit, though in practice SCOPs choose to retain on average about 45% of profit in this way. Collective capital reserves amounted to approximately US\$ 36,200 per employee on average in 2006, equivalent to about 21 months of median private sector pay (Fakhfakh, Perotin and Gago, 2012: 852).

workers as members and insiders in decision-making processes in cooperatives can favour the production of better information flows, and optimal decisions concerning human capital accumulation, contract incompleteness in the presence of limited information and contrasting interest in capitalist enterprises would result in increased agency costs and lower than optimal interaction between workers and the organization. The possibility to store and use additional resources (collective funds) to improve worker welfare, favour optimal accumulation of human capital and reduce the negative effects of cyclical fluctuations (e.g. layoffs during downturns) can result in human capital preservation and even in increased productivity. Hence, the explanation of the apparent contradictions we just highlighted: worker cooperatives do not appear to be strongly undercapitalized or to perform worse than IOFs even in the presence of large shares of shares of collective ownership in their capital structure. Furthermore, both in Italy and in France, cooperatives appear to plough back in indivisible reserved much more than is required by law, this way incurring a risk of dampening their own economic incentives. These additional effects, even when they increase costs by reducing lay-offs and by making decision making processes less expeditious, do not necessarily result in inefficient allocation of the inputs of production. They may more simply create different (and new) organizational patterns requiring different input mixes and partially different technologies, usually in the direction of making labour a more specific and less standard factor of production and in implementing, comparatively, more labour intensive production processes using partially different technologies. This does not need to result in lower efficiency. It may, instead, be interpreted a move away from isomorphism in the direction of institutional and organizational variety (Di Maggio and Powell, 1983).

Theoretical contributions and empirical test are limited and sparse and our work aims to contribute new results in this vein. A central aim of this paper is to investigate the extent to which internal finance and collective property rights affect the total factor productivity of cooperatives using longitudinal analysis and controlling for sector, firm characteristic and other possible confounding effects.





**Figure 1.** Internal versus external finance for cooperatives.

$Q$  = output,  $K$  = capital input,  $L$  = labour input,  $p$  = price of output,  $f_K$  = marginal product of capital,  $f_L$  = marginal product of labour,  $r$  = rate of interest,  $d$  = premium required because of the Furubotn-Pejovich effect

## 2.2 Risk-sharing in worker cooperatives

Risk-sharing is the central concept in a second set of arguments that militate against the feasibility of worker ownership and control over the enterprise. The argument starts from the observation that shareholders can differentiate their financial investments, while workers cannot, since the accumulation of their human capital leads to sunk utilization in one or few economic activities (Meade, 1972, 1986). Specialization of human capital can lead to the creation of positive rents over and above the market wage rate. However, this outcome is time and effort consuming, and comes at the cost of foregoing alternative occupations. This fundamental difference in risk bearing between holders of shares and holders of human capital would lead workers to implement “implicit contracts” with employers (Azariadis 1975; Azariadis and Stiglitz 1983; Baily 1974). Risk averse workers would renounce running an independent economic activity in exchange for stable and riskless economic remuneration received from their risk-neutral employer (Knight, 1921). This condition would be violated in worker-run enterprises, since in this case workers would have to invest both their human capital and financial wealth in the same economic activity, which is a risky venture, leaving no room for differentiation. The rarity of worker co-operatives would be explained

by the incompatibility between worker risk aversion and the highly risky environment of worker run enterprises. On the other hand, the possibility to differentiate investments would make financial investors less risk averse than workers, putting them in the best position to hire and guarantee a stable income stream to workers. The principal agent relation that characterizes the employment contract would give employers supervisory power over workers. Investment in a risky entrepreneurial venture bestows upon share-owners' residual control and residual appropriation rights, which implies that control mechanisms and economic incentives are set in place to align the agents' (workers') objectives with the objectives of the organization, in line with the principal agent framework and in the commodity theory of the firm (Putterman, 1988; Prendergast, 1999).

Employers as principals in worker-run enterprises embody ownership rights over the organization, which implies the possibility to set strategic and production objectives in line with profit maximization. This allows the capitalistic enterprise to achieve maximum efficiency in a way that cannot be replicated by self-managed groups of peers (Alchian and Demsetz, 1972).

This well-known argument is fundamentally flawed for at least five groups of reasons. First, investing by human and financial capital in the same economic venture is actually what all self-employed workers (e.g. artisans, craftsmen, dealers, retailers, shopkeepers, professionals do and have always done). Consequently, it is not necessary to assume a low degree of risk aversion to accept the idea that workers can managed at one and the same time both human and financial investments in one and the same venture. In other words, the conclusion implicit in this line of argument is that only very risk averse workers prefer employment in capitalist enterprises to self-employment in cooperatives. The problem of differentiation of financial risk has more to do with collective action and coordination, not with intrinsic psychological features of workers (risk-aversion). Second, not all capitalistic entrepreneurs are able to fully differentiate their financial investments. The financial structure of sole ownership and small enterprises is indeed characterized by a high degree of concentration of highly sunk investments. This can make entrepreneurs risk averse in a way similar to workers. On the other hand, workers themselves can behave as capitalist entrepreneurs in micro economic activities and invest their financial wealth in the same economic activity in which they work. Correspondingly, also members of worker-run enterprises can partially differentiate their financial investments by saving and investing in low-risk or riskless financial activities what is left after investments in their own co-operative have been carried out. Third, even if capitalist enterprises stabilize workers' income stream and workers bear no relevant financial risk, the total amount of economic risk borne by workers should include also the expected costs of layoff, and other negative events related to the employment relation, for example the danger of exploitation and unfair treatment (Navarra and Tortia, 2014; Albanese et al., 2015, 2019). Indeed, several

contributions show that worker cooperatives are characterized by more fluctuating wages and more stable employment patterns when compared to capitalist enterprises. The main function of wage flexibility in cooperatives is likely to be employment stabilization (Craig and Pencavel, 1992; Pencavel and Craig, 1994; Pencavel, Pistaferri and Schivardi, 2006; Burdin and Dean, 2009). Third, in most contemporary cooperative systems the largest share of investments is carried out directly by the organization in which worker-members are employed, not by worker themselves. The simplest instance of this kind of pattern is the retention by the firm of part or all positive residuals, which are then locked into indivisible reserves or trust funds, to carry out investment programmes. In other words, in this kind of systems, workers' intervention with personal financial resources is to be considered the exception more than the rule, if not in the very specific case of the creation of a new cooperative (when workers may be forced to invest their own financial resources). Again, financial risks undergone by worker-members are, in general, no higher than risks undergone by employees in capitalist enterprises. Finally, the total economic risk undergone by capitalist entrepreneurs is indeed at least partly borne by workers. While the expected benefits of financial investments accrue to the owners of the enterprise in terms of increased profits and shareholder value, the expected costs of negative economic outcomes are partially borne by workers in terms of expected lower wages, or layoff costs (search and matching costs, retraining, geographical relocation etc.; see for example Navarra and Tortia, 2014). Total risks and costs attached to the different position of worker members in cooperatives and of employees in capitalist enterprises cannot be easily ascertained and compared. They require detailed description and focussed empirical testing. As for the consequences of different ownership structures on productivity, this comparison too is complex and not amenable to clear cut simplification: the agency relation between employer and employee, and exclusive governance in capitalistic enterprises is substituted by horizontal monitoring, peer pressure and inclusive governance in cooperatives. Different agency relations are likely to result in different economic processes (different optimal mixes of physical and human capital; see the results by Conte and Svejnar (1988); Berman and Berman (1989); Estrin (1991); Craig and Pencavel, (1992, 1995); Pencavel and Craig (1994); Jones (2007); Fakhfakh, Perotin and Gago (2012). It is largely an empirical matter to test what ownership structure achieves the highest degree of efficiency. Given the absence of overarching theoretical arguments and of definitive empirical results, empirical tests of productivity and efficiency in co-operatives acquire a fundamental role (Bonin, Jones and Putterman (1993); Dow (2003, 2018); Tortia, 2003)). Beyond comparing cooperatives and investor owned companies, different capital structures in cooperatives, for example characterized by the presence or absence of collective ownership, can lead to different outcomes in terms of efficiency and productivity, and deserve specialized analysis, such as the one we present in this paper.

### 3 Italian Cooperatives

In this paper we analyse data on two types of Italian cooperative, workers' cooperatives (*cooperative di produzione e lavoro*, Production and Work Co-operatives, as defined by Italian legislation, D.Lgs.C.P.S. 1577/47)<sup>5</sup> and social cooperatives (*cooperative sociali*, as defined by a dedicated piece of legislation: law 381/1991). The former operate according to the tenets of the International Cooperative Alliance. Control rights are exercised via, "one vote per member" arrangements and membership is not tradable. Most but not all workers are cooperative members, but our data set does not allow us to distinguish labour supplied by cooperative members from that supplied by non-members. There is limited subscription of capital (purchase of co-operative shares) by worker-members and returns to subscribed capital are also limited (no more than 2.5 percentage points above the market interest rate. Individual capital stakes can, in principle, be redeemed by worker-members upon quitting the organization. The co-operative has to pay out the upfront value of these shares within about one year of members' departure. Worker-members can lend to their cooperatives at market interest rates (this is a specifically regulated financial instrument named Member Loan). These loans attract tax advantages, but overall the tax burden on cooperatives is no lower than on other comparable Italian firms<sup>6</sup> (see Fontanari and Borzaga, 2018). A proportion of annual profits is deposited in a collective reserve funds, which cannot be redeemed by individual worker-members leaving the cooperative. In case of liquidation of the organization, the residual value of collective reserves is paid out to national associations of co-operatives enterprises, which have to reinvest this sum in new co-operative ventures nationwide. The size of this reserve fund provides a proxy for the extent of collective property rights. The remainder of annual profits are

---

<sup>5</sup> The fundamental law for all Italian co-operative enterprises, not only worker, but also consumer, producer, credit, social, etc., is the so call Basevi law – named after the Parliamentary promoter of the law - D.Lgs.C.P.S. n. 1577/47 – issued by Provisional Head of State in 1947.

<sup>6</sup> From a fiscal point of view, it is necessary to take into account not only single taxes - particularly those based on profits not distributed to their owners - but the concept of "fiscal burden", which considers the total amount of resources transferred in various ways by firms to the state coffers. This variable allows the quantification of not only the taxes related to the corporate income, but also those levied on labour cost (and the correlated social security costs). Using this calculation method, the effects of a different final distribution of income to the production factors are taken into account.

returned to members via remunerating capital underwritten by members, a bonus proportional to labour supply, or the provision of social and other benefits.

Italian social cooperatives are multi-stakeholder cooperatives. Their purpose is to provide social services, which supplement or substitute provision by central or local government. These include care for the disabled, the elderly and children. Thomas (2004) discusses the role of Italian social cooperatives in the provision of social welfare services. Some social cooperatives have a specialised function in assisting previously unemployed people and to integrate them into employment. Stakeholders can include paid workers, volunteers (up to 50% of cooperative members), some public institutions, outside investors (without control rights) and, importantly, beneficiaries of the cooperatives activities. Italian social cooperatives have legal personality and limited liability. Control rights are exercised on a one vote per member basis. A maximum of 67% of profits can be distributed<sup>7</sup> and the interest rate is limited to a particular bond rate. Assets cannot be distributed. There are two type of social cooperative in Italy. Type A cooperatives supply educational, social or health services. Type B cooperatives assist disadvantaged workers to help them integrate into employment. Disadvantaged persons include those with physical or mental disability, developmental disorders, and drug and alcohol addiction. They do not include other categories of disadvantage such as sexism, racism, homophobia or domestic violence. In B-Type cooperatives a minimum of 30% of members must come from the target disadvantaged groups. A small number of Italian cooperatives have both Type A and Type B legal status.

According to the first official report carried out by the National Institute of Statistics (ISTAT, 2019) and by the European Research Institute on Cooperatives and Social Enterprises (EURICSE, 2015), worker and social cooperatives represented respectively 49.2 % (29,414 units) and 24.2% (14,263 units) of the total number of cooperatives operating in Italy.

Besides representing the largest number of companies, worker and social cooperatives are also the two cooperative forms that generated the greatest value-added: respectively 12.9 and 8.1 billion euros equal, overall, to 73.4 % of the value-added produced by all Italian cooperatives in 2015.

The data on the number of employees confirm the importance of worker and social cooperatives: four employees out of ten are employed in worker cooperatives and three out of 10 in social

---

<sup>7</sup> Italian cooperatives have to allocate to mandatory indivisible reserve 30% of the annual profit plus 3% to the national mutual funds that are in charge of financing new cooperative ventures nationwide. This way, the distributable share of annual profits is 67%.

cooperatives. At a more general level, all the Italian cooperatives taken together contribute 4.4% of GDP and 7.4% of employment in the private sector<sup>8</sup>.

The greater incidence of Italian cooperatives in terms of employment, as compared to their weight in terms of value-added, highlights their labour-intensive nature. This peculiarity also emerges from the analysis of the value-added distribution to the production factors. In fact, in Italian cooperatives, the weight of labour cost is equal to 86 cents per euro of value-added. This is true especially in the case of worker cooperatives with a share of 88 cents and in the case of social cooperatives with 92 cents per euro of value-added. In the other firm types this coefficient is no higher than 52 cents.

In addition, another study (Fontanari and Borzaga, 2018), which examines the balance sheets of cooperatives and investor-owned firms operating in Italy in 2015, shows that the financial equilibrium (both short and long term) of the former is not inferior to that of the latter. This study uses neutral indicators that are capable of correctly and simultaneously interpreting the peculiarities of both enterprise forms. In particular, in the case of worker and social cooperatives, where labour is the specific resource of the firm, we find more interesting results. Taking into consideration the long-term indicator, we find that each unit of capital invested in long-term assets is more than covered by the sum of long-term debts and equity, and to a greater extent than investor-owned firms.

Specifically, the long-term index is equal to 147% and 138% respectively in the case of social and worker cooperatives compared to 105% in joint-stock companies, and 128% in limited liability companies.

The same study also underlines that during the economic crisis Italian cooperatives managed to increase their equity more than investor-owned firms: + 29.5% from 2008 to 2015 in cooperatives compared to 20.5% in joint-stock companies (*Società per Azioni*) and 18.1% in limited liability companies (*Società a Responsabilità Limitata*). Likewise, as regards total assets, the growth rate recorded by cooperatives (+ 16.4%) in the same time span is in line with that of joint-stock companies (+ 18.3%), but much higher than that of limited liability companies (+11.1%).

These initial results are in line with the idea that cooperatives are less capitalized than investor owned companies and self-select into labour-intensive sectors (Podivinsky and Stewart, 2006). However, they do not support different hypotheses concerning degeneration (Ben-Ner, 1984, 1988), since most workers are also members and not simple employees in Italian worker cooperatives. Neither do they indicate an inability to survive in competitive contexts, as a large share of existing

---

<sup>8</sup> These results only refer to the direct impact. A non-published study (Fontanari, Borzaga, forthcoming) reveals the total weight (direct, indirect and induced) of the Italian cooperatives on the national economy rises to almost 7% of the GDP and around 9% of the employment.

co-operatives have been active for several decades, and a growing number are now aged more than one-hundred years. As already stated, differences in factor utilization (labour and physical assets) between cooperatives and investor owned companies, are clearly apparent as in France (Fakhfakh, Perotin and Gago, 2012). On the other hand, the ability of Italian co-operatives to reach financial equilibrium on their own terms, as shown by Fontanari and Borzaga (2018), can cast doubt on the theoretical assumptions of the claim that co-operatives would undergo fatal difficulties to finance themselves and to achieve efficient production. Lastly, standard economic theory discussed in Section 2 above, is less applicable to social than to workers' cooperatives, particularly to B-Type social co-ops. It is nonetheless important to analyse the determinants of their productivity.

## 4 The Data Set

The data set was built by combining three different administrative sources. First of all, Aida Bureau Van Dijk, which collects the balance sheet data of all companies that have the obligation to record them at the Chamber of Commerce, that is, in Italian legislation, cooperatives and investor-owned firms (joint-stock companies – SPAs – and limited liability companies – SRLs). Secondly, the Italian social security database gathering data on employment, from which it was possible to calculate the full-time equivalent units of labour (FTE) from the total number of labour contracts signed by the relevant cooperatives. Thirdly, the Cooperative register kept by the Ministry for Economic Development, which allows to classify Italian cooperatives by type (worker, consumer, social, etc.).

The resulting database was organised using Stata 15, as a panel of 11,289 cooperatives over seven years, from 2008 to 2014, yielding 79,023 observations. The panel included 5,834 workers' cooperatives and 5,455 social cooperatives. Outlier observations with negative value-added, negative fixed capital or zero FTE values were dropped prior to the regressions being carried out, reducing the panel to 11,139 cooperatives (5,753 workers' cooperatives and 5,386 social cooperatives), and reducing the number of observations from 79,023 to 74,853, leaving the panel slightly unbalanced. The final data set included 45 variables.

The data set included cooperatives from six sectors of the Italian economy as follows:

- 1 Agrofood (246 cooperatives)
- 2 Distributive trades (407 cooperatives)
- 3 Health and social assistance (3,105 cooperatives)
- 4 Non-food industry (1,864 cooperatives)
- 5 Other services (4,390 cooperatives)

## 6 Transport and storage (1,127 cooperatives)

The data set included cooperatives from all regions of Italy as follows:

1. Central (2,209 cooperatives)
2. Islands (1,555 cooperatives)
3. Northeast (2,311 cooperatives)
4. Northwest (2,691 cooperatives)
5. South (2,373 cooperatives)

For completeness, sectoral and regional regression results are reported in Appendix 1.

The data set included social cooperatives of the three types described in Section 3 above, though some social cooperatives could not be classified as any of these three types. Numbers of cooperatives of each type were as follows:

1. Type A: 3,094 cooperatives
2. Type A and B: 312 cooperatives
3. Type B: 1,419 cooperatives

For completeness regression results for each type of social cooperative are reported in Appendix A2.

## 5 Econometric Model

### 5.1 Construction of variables

In our longitudinal model, variables were defined as follows:

- realQ (output: Q) = value-added deflated by the Italian GDP deflator
- realK (fixed capital: K) = tangible fixed assets + intangible fixed assets, deflated by the Italian GDP deflator)
- realmemberscap (real members' capital: C) = the value of members' shares, deflated by the Italian GDP deflator
- FTE (L) = fulltime equivalent labour input (i.e. adjusted for part-time workers)



- $\text{realCRFperhead}$  (proxy for the extent of collective property rights:  $X_1$ ) = collective reserve fund per FTE worker, deflated by the Italian GDP deflator. Collective reserve fund (CRF) is defined as Equity – Members' Capital – Net Income of the Year.
- SFI (self-financing index<sup>9</sup>, a proxy for the extent of internal finance:  $X_2$ ) = Equity/Fixed Assets
- age = number of years since the cooperative was first registered with the Chamber of Commerce.

The variable “dummy” takes the value 1 for workers' cooperatives and 2 for social cooperatives. Dummy variables were also created to distinguish the different types of social cooperative (Type A and B). Further sectoral and regional dummies were created: sectoral and regional results are reported in Appendix 1. Regression results for the three categories of social cooperative are reported in Appendix 2. The final data set included 45 variables. Summary statistics for the key variables are shown in Table 1 (all coops), Table 2 (workers' coops) and Table 3 (social coops).

**Table 1.** Summary statistics for key variables (all coops).

Variable	Obs	Mean	Std. Dev.	Min	Max
realQ	74,853	10518.89	55854.28	.0401276	2838445
realK	74,838	4267.405	39406.29	.0095135	2752958
FTE	74,853	32.16823	153.5764	.0032051	9254.8
realmember~p	74,850	919.0867	8909.113	-101.4146	493030.9
realCRFper~d	74,850	209.2729	3744.784	-102556.3	921593.1
SFI	74,825	5.830297	421.1202	-73141	47522
age	74,853	6081.941	4417.85	33	50335

<sup>9</sup> This choice follows the reasoning presented in the theoretical part about the importance of linking the equity to long-term investments and whose level is related to the nature of the productive activity.

**Table 2.** Summary statistics for key variables (worker's coops).

Variable	Obs	Mean	Std. Dev.	Min	Max
realQ	38,574	10911.04	69444.08	.0401276	2838445
realK	38,570	4893.1	53237.73	.0095135	2752958
FTE	38,574	29.15498	178.4868	.0032051	9254.8
realmember~p	38,572	1187.789	11907.38	-101.4146	493030.9
realCRFper~d	38,572	248.726	4829.223	-13461.03	921593.1
SFI	38,563	5.743148	405.8637	-61534	47522
age	38,574	6439.913	5047.196	33	50335

**Table 3.** Summary statistics for key variables (social coops).

Variable	Obs	Mean	Std. Dev.	Min	Max
realQ	36,279	10101.93	36179.4	.5216484	1264505
realK	36,268	3601.995	13758.75	.0095135	549463.9
FTE	36,279	35.37209	121.5373	.008547	3857.55
realmember~p	36,278	633.3928	3585.53	0	163227.8
realCRFper~d	36,278	167.3249	2033.327	-102556.3	204848.3
SFI	36,262	5.922975	436.7661	-73141	30107
age	36,279	5701.324	3592.1	42	45200

## 5.2 Model specification

The econometric analysis is based on the estimation of augmented production functions for workers' and social cooperatives, using the data set described in Section 4 above. We start from an augmented Cobb-Douglas productions function:

$$Q = A \cdot \exp(\gamma_1 \cdot X_1 + \gamma_2 \cdot X_2) \cdot K^\alpha L^\beta C^\delta \quad (1)$$

Taking logs and re-arranging (1) yields:

$$\ln \frac{Q}{L} = \ln A + \alpha \ln \frac{K}{L} + \delta \ln \frac{C}{L} + (\alpha + \beta + \delta - 1) \ln L + (\gamma_1 \cdot X_1 + \gamma_2 \cdot X_2) \quad (2)$$

The age of each cooperative was included as an independent variable, defined as number of days since the cooperative was first registered with the Chamber of Commerce. We have included this variable because it can influence the level of capital accumulation and the 'economic path' of a firm.

All cooperatives in the dataset were extant for each of the seven years it covers. It was not possible to account for any mergers or takeovers which may have occurred during that seven years period.

The variable “dummy” was also included, taking the value 1 for workers’ coops and 2 for social coops.

### 5.3 Methods of estimation

Equation (2) was estimated using the dataset described in Section 4, using the Stata 15 package.

Initially OLS was used with the entire dataset (after dropping outliers) included in the regression: the results are reported in Table 4.

**Table 4.** OLS regression

loglabprod	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
logCapintensity	.0718941	.0010374	69.30	0.000	.0698609	.0739274
logmemberscapintensity	.0247154	.001017	24.30	0.000	.0227221	.0267086
logFTE	.0000807	.0013889	0.06	0.954	-.0026414	.0028029
realCRFperhead	.0000113	5.13e-07	21.97	0.000	.0000103	.0000123
SFI	7.78e-06	4.54e-06	1.71	0.087	-1.12e-06	.0000167
age	8.27e-06	4.74e-07	17.46	0.000	7.34e-06	9.20e-06
dummy	-.1648253	.0039429	-41.80	0.000	-.1725534	-.1570972
_cons	5.574351	.0079426	701.83	0.000	5.558784	5.589918

Both the capital intensity variables (logCapIntensity and logmemberscapintensity) have positive coefficients, significant at 5%, though the coefficient on fixed capital intensity is approximately three times the coefficient on members’ capital intensity. The coefficient on full time equivalent units of labour (logFTE) is not significantly different from zero (at the 5% level) implying that  $\alpha + \beta + \delta = 1$ . This in turn implies that cooperatives are operating under constant returns to scale, at the technically efficient (minimum long-run average cost) scale of production. The coefficient on collective reserve funds (realCRFperhead) is significantly positive (at the 5% level), suggesting that collective property rights *improve* productivity. The coefficient on the self-finance index (SFI) is not significantly different from zero, suggesting no negative effect of internal (or external) finance on productivity. Co-operatives appear instead to optimally arbitrage internal and external funds at the margin, coherently with static trade-off theory of capital structure (Modigliani and Miller, 1958) The age variable has a significantly positive coefficient, implying that older co-ops are more productive than younger ones, probably due to the presence of a partial non-profit constraint and the asset lock, which favour capital accumulation over time. The dummy variable has a significantly negative coefficient, suggesting that social cooperatives are less productive than worker cooperatives.

There is clearly a problem with omitted variables, which suggests recourse to fixed effects regressions. The dummy variables described above are clearly co-linear with the cooperative-specific

intercepts required by fixed effects, and accordingly are omitted by Stata. So separate fixed effects regressions were carried out for the different cooperative types. Dummy variables for geographical region and economic sector were treated in the same way. Results from the fixed effects regressions are shown in Table 5 (workers' cooperatives) and Table 6 (social cooperatives).

**Table 5.** Fixed effects regression for workers' cooperatives

loglabprod	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
logCapintensity	.0538911	.0028223	19.09	0.000	.0483593	.0594229
logmemberscapintensity	.0407373	.0038109	10.69	0.000	.0332677	.0482069
logFTE	-.2173471	.0057099	-38.06	0.000	-.2285388	-.2061555
realCRFperhead	7.25e-06	4.38e-07	16.53	0.000	6.39e-06	8.10e-06
SFI	7.43e-06	5.49e-06	1.35	0.176	-3.33e-06	.0000182
age	5.36e-06	2.69e-06	1.99	0.047	7.92e-08	.0000106
_cons	5.856784	.0275245	212.78	0.000	5.802835	5.910733

**Table 6.** Fixed effect regression for social cooperatives

loglabprod	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
logCapintensity	.0375399	.0023138	16.22	0.000	.0330049	.042075
logmemberscapintensity	.0201292	.0028183	7.14	0.000	.0146052	.0256532
logFTE	-.1769469	.0050537	-35.01	0.000	-.1868523	-.1670414
realCRFperhead	5.50e-06	1.97e-06	2.80	0.005	1.64e-06	9.36e-06
SFI	-.0000153	4.27e-06	-3.58	0.000	-.0000237	-6.93e-06
age	.0000423	2.39e-06	17.71	0.000	.0000377	.000047
_cons	5.605009	.0206166	271.87	0.000	5.5646	5.645418

The coefficients on both types of capital input are significantly positive and lower for social cooperatives, confirming the result of the OLS regression that social cooperatives have lower total factor productivity than workers' cooperatives. For each type of cooperative, the fixed effects coefficients for the two types of capital are of similar size, contrasting with the OLS coefficients. For each type of cooperative, the coefficient on the labour input (FTE) is significantly negative, indicating that both types of co-operative firm operate under decreasing returns to scale (i.e. they are not "too small"). The coefficient on collective property rights (realCRFperhead) is significantly positive for both types of cooperative, confirming the OLS result that collective property rights *improve* total factor productivity. For social cooperatives the coefficient on self-financing (SFI) is significantly

negative, indicating a negative effect on total factor productivity (in contrast with the OLS results). For workers' cooperatives the self-financing effect is not significantly different from zero. The age variable has a significantly positive coefficient for both types of cooperative.

#### 5.4 Members' capital as an augmenting variable

It could be argued that members' capital should be treated as an augmenting variable rather than an input in the conventional sense. That is the production function (1) should be specified as:

$$Q = A \cdot \exp(\gamma_1 \cdot X_1 + \gamma_2 \cdot X_2 + \gamma_3 X_3) \cdot K^\alpha L^\beta \quad (3)$$

where:  $X_3$  = memberscapintensity.

To investigate this possibility the above regressions were re-run with the variable "memberscapintensity" included in levels rather than logs. The results are reported in Table 7 (workers' cooperatives) and Table 8 (social cooperatives).

**Table 7.** Members' capital intensity as an augmenting variable (workers' cooperatives)

loglabprod	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
logCapintensity	.0562969	.0028155	20.00	0.000	.0507784	.0618154
logFTE	-.2470666	.0049443	-49.97	0.000	-.2567576	-.2373756
memberscapintensity	-8.20e-06	3.34e-06	-2.45	0.014	-.0000148	-1.65e-06
realCRFperhead	.0000139	2.64e-06	5.26	0.000	8.72e-06	.0000191
SFI	7.60e-06	5.50e-06	1.38	0.167	-3.18e-06	.0000184
age	7.68e-06	2.69e-06	2.86	0.004	2.41e-06	.0000129
_cons	5.970509	.0253558	235.47	0.000	5.920811	6.020207

**Table 8.** Members' capital intensity as an augmenting variable (social cooperatives)

loglabprod	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
logCapintensity	.0380383	.0023027	16.52	0.000	.0335248	.0425517
logFTE	-.1851405	.0045764	-40.46	0.000	-.1941104	-.1761706
memberscapintensity	.0000202	1.74e-06	11.62	0.000	.0000168	.0000236
realCRFperhead	.0000218	2.42e-06	9.01	0.000	.0000171	.0000266
SFI	-.0000153	4.26e-06	-3.58	0.000	-.0000236	-6.92e-06
age	.000045	2.33e-06	19.28	0.000	.0000404	.0000495
_cons	5.639087	.0195522	288.41	0.000	5.600764	5.67741

Results change quantitatively, but not qualitatively, and collective capital still has positive and significant effect on productivity. All our estimates confirm a positive and significant impact of

collective capital reserves of productivity, though this impact appears to be much stronger in worker than in social cooperatives. Since this is one of the main results in our study and needs clarification. The impact of collective capital on productivity is calculated net of the impact of tangible and intangible fixed assets, it means that collective capital exerts its own influences over and above the level of capitalization per se. That is, it is not just a matter of the quantity of accumulated collective capital, as measured by factor elasticities (the coefficient  $\alpha$  in the regression model) and by the marginal productivity of capital, but also of its economic function, which has been often hypothesized to have a negative role in business enterprises (due to the dampening of economic and financial incentives). We find, instead, a positive and robust role of collective capital. It is worth exploring these functions, which may be connected to different factors, as collective capital: (i) stabilizes production plans, since it is under the strict control of co-operative managers. It allows management to organize effectively the existing assets and to combine them with stable organizational routines and human resource management; (ii) being owned by the co-operative itself, it allows co-operatives to plan investment programs in the medium to long run. Given the old age of a large share of Italian co-operatives, it appears indeed that collective capital can help them overcome the horizon problem. Far from causing under-investments, under appropriate conditions, collective capital can have the function of *completing* the limited temporally horizon of worker-members in investment decisions and in the deployment of production plans. In this, governance, not economic incentives, is likely to have a more fundamental role in reaching efficient outcomes (Ostrom, 1990; Tortia, 2018).

## 6 Conclusions and policy implications

In this paper we strove to replicate and advance previous results concerning efficiency and factor utilization of cooperative enterprises, especially focussing on issues relating to under-investments, and on the relevance (positive, negative or neutral) role of collective reserves of capital in enhancing co-operative efficiency. We do this on country-wide data on Italian worker and social cooperatives. Our worker is closest to the paper by Fakhfakh, Peroting and Gago (2012), who performed a similar analysis using French national data. Contrary to expectations derived from economic theory we do not find that collective capital engenders under-capitalization in terms of a too low scale of production (increasing returns to scale). Quite the contrary, we find that cooperatives operate either at constant or decreasing returns to scale (they are not under-capitalized). Furthermore, correlation analysis shows that older co-ops are more capitalized than younger ones, and this implies that co-

operatives do indeed increase capitalization over long spells of time (a result that is not coherent with the under-capitalization hypotheses). Furthermore, the correlation between collective capital and fixed assets is itself positive, implying that collective capital does not hamper the accumulation of fixed assets. Quite the contrary, it looks like that more abundant collective capital favours more investments and capitalization, probably due to the availability of more collateral guarantees that allow the attainment of cheaper borrowing from financial institutions.

In more general terms, when productivity and efficient production are considered, our analysis indicates that collective property rights do not impair productivity, as the presence of collective reserves appear to unambiguously increase the efficiency of production. We strove to explain what positive economic and financial functions are played by this kind of property (e.g. stabilization of production and investment plans over and above the quantitative dimension of fixed capital and completion of the truncated temporal horizon of members), which would explain its positive impact on productivity. The possibility to use retained earnings and increased fixed assets in production in the presence of a partial non-profit distribution constraint and of the asset lock may be sufficient to explain this result. Also, there is a significant but small age effect on total factor productivity: older cooperatives have higher total factor productivity than younger ones. Again, higher capitalization in older cooperatives can imply that better efficiency and higher productivity are achieved over time.

When results concerning worker cooperatives are compared to the results concerning social cooperatives, the latter have lower total factor productivity than the former. On the other hand, internal finance does not impair productivity for workers' cooperatives but may do so for social cooperatives. Internal finance may appear to be detrimental in the case of social cooperatives, because Type A social cooperatives carry out their activities on the basis of procurement contracts and public tenders. Their dominant feature of providers of social services, that are characterized by high labour intensity would imply that, even if they are more productive than Type B social cooperatives, they need lower amounts of internal funds. On the contrary, industrial social cooperatives, which are most of the times of B Type, require higher capitalization to carry out industrial production but, at one and the same time, produce a lower value added because they are conceived for the re-integration of disadvantaged subjects into the labour market.

The role and potential of governance rules in complementing individual financial incentives and even in replacing them when they lead to inefficient results (under-capitalization), in order to achieve completion of members' truncated temporal horizon, clearly need further theoretical and empirical investigation. The solution of different fundamental social dilemmas in collective entrepreneurial action (e.g. tragedy of the commons-like situations) represents a *conditio sine qua non* for the achievement of efficient production and capitalization in cooperatives. The literature on

the management of common-pool natural resources initiated by Elinor Ostrom in 1990 took fundamental steps and reached path-breaking results in highlighting the role of governance, and in studying the conditions under which the governance of collective action is likely to succeed or fail in achieving efficiency. However, much work is still required, as the role of governance in collective action needs to be contextualised in the study of entrepreneurial action and enterprise organization. Furthermore, while common goods as natural resources are available in natural settings, accumulation of capital in enterprises depends on investment rates through time (Borzaga and Tortia, 2017).

Policy implications require that co-operatives are left to work and to survive and reach efficiency on their own terms, without the need to force them to follow the same standards and to use the same technologies (combinations of production factors) as conventional enterprises. This is in contrast with well-known isomorphism hypotheses.

## Acknowledgements

We are grateful to Robert Zymek and Mike Elsby for helpful advice. Any remaining errors or omissions are entirely our own.



## Appendix 1. Sectoral and regional regressions

The dummy variable “msectordummy” was created to represent six sectors of the economy, as follows:

- 1 Agrofood
- 2 Distributive trades
- 3 Health and social assistance
- 4 Non-food industry
- 5 Other services
- 6 Transport and storage

Sectoral regression results are reported in Tables A1 – A6.

**Table A1. Agrofood**

loglabprod	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
logCapintensity	.1276538	.01835	6.96	0.000	.0916576	.16365
logmemberscapintensity	.0092728	.0171894	0.54	0.590	-.0244467	.0429923
logFTE	-.1635919	.030841	-5.30	0.000	-.224091	-.1030929
realCRFperhead	-.0000871	.0000221	-3.93	0.000	-.0001305	-.0000436
SFI	.001388	.00033	4.21	0.000	.0007406	.0020353
age	8.89e-06	.0000133	0.67	0.503	-.0000171	.0000349
_cons	5.367127	.160907	33.36	0.000	5.051485	5.682769

**Table A2. Distributive trades**

loglabprod	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
logCapintensity	.0825144	.0138109	5.97	0.000	.0554314	.1095974
logmemberscapintensity	.0658933	.0180296	3.65	0.000	.0305375	.1012491
logFTE	-.2803837	.0296303	-9.46	0.000	-.3384883	-.2222791
realCRFperhead	-.0000185	.0000146	-1.27	0.204	-.000047	.0000101
SFI	.0005016	.000201	2.50	0.013	.0001074	.0008957
age	.0000185	.0000124	1.49	0.135	-5.78e-06	.0000427
_cons	5.413744	.1181195	45.83	0.000	5.182113	5.645375

**Table A3. Health and social assistance**

loglabprod	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
logCapintensity	.0311498	.0027323	11.40	0.000	.0257942	.0365054
logmemberscapintensity	.0213624	.0033938	6.29	0.000	.0147102	.0280147
logFTE	-.1870752	.006177	-30.29	0.000	-.1991827	-.1749678
realCRFperhead	2.12e-06	2.59e-06	0.82	0.413	-2.95e-06	7.19e-06
SFI	-.0000187	4.20e-06	-4.45	0.000	-.0000269	-.0000104
age	.0000493	2.86e-06	17.19	0.000	.0000436	.0000549
_cons	5.680588	.0254706	223.03	0.000	5.630663	5.730512

**Table A4. Non-food industry**

loglabprod	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
logCapintensity	.0503954	.0048164	10.46	0.000	.0409543	.0598365
logmemberscapintensity	.0289524	.0060736	4.77	0.000	.017047	.0408579
logFTE	-.1828755	.009363	-19.53	0.000	-.2012288	-.1645223
realCRFperhead	.0000161	5.11e-06	3.15	0.002	6.07e-06	.0000261
SFI	.0000196	7.95e-06	2.47	0.013	4.06e-06	.0000352
age	-.0000152	4.37e-06	-3.47	0.001	-.0000237	-6.61e-06
_cons	6.010925	.0477499	125.88	0.000	5.917326	6.104524

**Table A5. Other services**

loglabprod	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
logCapintensity	.0521264	.0031888	16.35	0.000	.0458762	.0583766
logmemberscapintensity	.0275811	.0041005	6.73	0.000	.0195438	.0356184
logFTE	-.2402906	.0066244	-36.27	0.000	-.2532748	-.2273064
realCRFperhead	7.26e-06	4.50e-07	16.13	0.000	6.38e-06	8.14e-06
SFI	-2.47e-07	6.53e-06	-0.04	0.970	-.000013	.0000126
age	.0000263	3.19e-06	8.24	0.000	.00002	.0000326
_cons	5.682579	.0281596	201.80	0.000	5.627385	5.737774

**Table A6. Transport and storage**

loglabprod	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
logCapintensity	.0427654	.0046015	9.29	0.000	.0337449	.0517859
logmemberscapintensity	.0405943	.006415	6.33	0.000	.0280188	.0531698
logFTE	-.0764071	.0090479	-8.44	0.000	-.0941439	-.0586703
realCRFperhead	.0000742	7.42e-06	10.00	0.000	.0000596	.0000887
SFI	.0000101	.0001024	0.10	0.921	-.0001907	.0002109
age	.0000178	4.42e-06	4.03	0.000	9.16e-06	.0000265
_cons	5.649522	.0469293	120.38	0.000	5.557525	5.741519

The dummy variable “regiondummy” was created to represent five geographical regions as follows:

1. Central
2. Islands
3. Northeast
4. Northwest
5. South

Regional regression results are reported in tables A7- A11.

**Table A7. Central**

loglabprod	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
logCapintensity	.0573995	.0042969	13.36	0.000	.0489769	.0658221
logmemberscapintensity	.0351684	.0061058	5.76	0.000	.0232	.0471368
logFTE	-.2038274	.0090839	-22.44	0.000	-.2216332	-.1860216
realCRFperhead	7.04e-06	4.31e-07	16.31	0.000	6.19e-06	7.88e-06
SFI	.0001223	.0000581	2.11	0.035	8.49e-06	.0002361
age	.0000181	4.18e-06	4.33	0.000	9.91e-06	.0000263
_cons	5.732333	.0413476	138.64	0.000	5.651286	5.813381

**Table A8. Islands**

loglabprod	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
logCapintensity	.0505544	.0055154	9.17	0.000	.039743	.0613658
logmemberscapintensity	.0145008	.0062268	2.33	0.020	.0022948	.0267068
logFTE	-.1989925	.0107323	-18.54	0.000	-.2200302	-.1779548
realCRFperhead	.0000391	7.89e-06	4.96	0.000	.0000237	.0000546
SFI	.0001082	.0000599	1.81	0.071	-9.15e-06	.0002255
age	.0000149	5.36e-06	2.77	0.006	4.36e-06	.0000254
_cons	5.691143	.046756	121.72	0.000	5.59949	5.782795

**Table A9. Northeast**

loglabprod	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
logCapintensity	.0469067	.003768	12.45	0.000	.0395209	.0542925
logmemberscapintensity	.0383837	.0045648	8.41	0.000	.0294362	.0473313
logFTE	-.2168758	.0080751	-26.86	0.000	-.2327042	-.2010473
realCRFperhead	-.0000182	5.34e-06	-3.42	0.001	-.0000287	-7.79e-06
SFI	.0000811	.0000534	1.52	0.129	-.0000236	.0001858
age	.0000306	3.37e-06	9.09	0.000	.000024	.0000372
_cons	5.82084	.0377377	154.24	0.000	5.746868	5.894811

**Table A10. Northwest**

loglabprod	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
logCapintensity	.0335242	.0032874	10.20	0.000	.0270804	.0399679
logmemberscapintensity	.0225721	.0035817	6.30	0.000	.0155515	.0295926
logFTE	-.1401722	.0070056	-20.01	0.000	-.1539041	-.1264404
realCRFperhead	.0000201	2.65e-06	7.58	0.000	.0000149	.0000253
SFI	-.000013	3.43e-06	-3.79	0.000	-.0000197	-6.28e-06
age	.0000227	3.26e-06	6.95	0.000	.0000163	.0000291
_cons	5.708862	.0300045	190.27	0.000	5.65005	5.767674

**Table A11. South**

loglabprod	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
logCapintensity	.0501079	.004237	11.83	0.000	.0418028	.058413
logmemberscapintensity	.0479274	.0069848	6.86	0.000	.0342362	.0616185
logFTE	-.2031705	.0094504	-21.50	0.000	-.2216947	-.1846462
realCRFperhead	.000011	2.72e-06	4.06	0.000	5.70e-06	.0000163
SFI	.0000202	8.76e-06	2.31	0.021	3.06e-06	.0000374
age	.0000283	4.50e-06	6.30	0.000	.0000195	.0000372
_cons	5.568779	.0379177	146.87	0.000	5.494455	5.643103

## Appendix 2. Regression results for the three categories of social cooperative

**Table A12. Social cooperatives type A**

loglabprod	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
logCapintensity	.029562	.0029611	9.98	0.000	.023758	.0353661
logmemberscapintensity	.0198762	.0037167	5.35	0.000	.0125912	.0271612
logFTE	-.2043435	.0068999	-29.62	0.000	-.217868	-.1908191
realCRFperhead	3.03e-06	2.82e-06	1.08	0.282	-2.49e-06	8.55e-06
SFI	-.0000161	4.25e-06	-3.80	0.000	-.0000245	-7.80e-06
age	.00005	3.13e-06	15.95	0.000	.0000438	.0000561
_cons	5.687442	.0276623	205.60	0.000	5.633222	5.741663

**Table A13. Social cooperatives type A+B**

loglabprod	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
logCapintensity	.0586002	.0107585	5.45	0.000	.0374996	.0797009
logmemberscapintensity	-.0126512	.0128865	-0.98	0.326	-.0379255	.0126231
logFTE	-.1567247	.0206932	-7.57	0.000	-.1973103	-.1161391
realCRFperhead	-4.32e-06	.0000163	-0.26	0.791	-.0000363	.0000277
SFI	.0008718	.0003292	2.65	0.008	.0002261	.0015174
age	.0000555	.0000112	4.96	0.000	.0000336	.0000774
_cons	5.510946	.0841439	65.49	0.000	5.345914	5.675977

**Table A14. Social cooperatives type B**

loglabprod	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
logCapintensity	.050772	.0044929	11.30	0.000	.0419647	.0595792
logmemberscapintensity	.0148303	.0049803	2.98	0.003	.0050676	.0245929
logFTE	-.1572094	.0089206	-17.62	0.000	-.1746961	-.1397227
realCRFperhead	.000011	2.79e-06	3.94	0.000	5.54e-06	.0000165
SFI	.0003067	.0000935	3.28	0.001	.0001234	.0004901
age	.0000239	4.43e-06	5.39	0.000	.0000152	.0000325
_cons	5.553292	.0373236	148.79	0.000	5.480128	5.626456

## References

- Albanese, Marina, Navarra, Cecilia, and Tortia, Ermanno, 2015. Employer moral hazard and wage rigidity. The case of worker owned and investor owned firms. *International Review of Law and Economics*, 43(C): 227-237.
- Albanese, Marina, Navarra, Cecilia, and Tortia, Ermanno, 2019. Equilibrium unemployment as a worker insurance device: wage setting in worker owned enterprises. *Economia Politica*. Online first. DOI: 10.1007/s40888-018-00139-z
- Ben-Ner, Avner. 1984. On the stability of the cooperative type of organization. *Journal of Comparative Economics* 8(3): 247–60.
- Ben- Ner, Avner. 1988. The life cycle of worker-owned firms in market economies. *Journal of Economic Behavior and Organization* 1(3): 287–313.
- Berman, Katrina V., and Matthew D. Berman. 1989. An empirical test of the theory of the labor-managed firm. *Journal of Comparative Economics* 13: 281–300.
- Borzaga, C. and Tortia, E.C., 2017. Cooperation as coordination mechanism: A new approach to the economics of cooperative enterprises. In J. Michie, J. R. Blasi, & C. Borzaga (Eds.), *The Oxford handbook of mutual, cooperative, and co-owned business* (pp. 55–75). Oxford: Oxford University Press.

- Burdín, Gabriel, and Dean, Andrés (2009). New evidence on wages and employment in worker cooperatives compared with capitalist firms. *Journal of Comparative Economics* 37 517–533.
- Conte, Michael A., and Jan Svejnar. 1988. Productivity effects of worker participation in management, profit-sharing, worker ownership of assets and unionization in US firms. *International Journal of Industrial Organization* 6: 139–51.
- Craig, Ben, and John Pencavel. 1992. The behavior of worker cooperatives: The plywood companies of the Pacific Northwest. *American Economic Review* 82 (5): 1083–105.
- Craig, Ben, and John Pencavel. 1995. Participation and productivity: A comparison of worker cooperatives and conventional firms in the plywood industry. *Brookings Papers: Microeconomics*, pp. 121–74. Washington (DC): Brookings Institution Press.
- DiMaggio, Paul J. and Powell, Walter W. 1983. The Iron Cage Revisited: Institutional Isomorphism and Collective Rationality in Organizational Fields. *American Sociological Review*, 48(2): 147-160.
- Dow, G. K. 2018. *The Labor-Managed Firm: Theoretical Foundations*. Cambridge, UK: Cambridge University Press.
- Ellerman, D. 1986. Horizon problems and property rights in labor-managed firms. *Journal of Comparative Economics*, 10(1), 62–78.
- Estrin, Saul. 1991. Some reflections on self-management, social choice, and reform in Eastern Europe. *Journal of Comparative Economics* 15: 349–66.
- Estrin, S., & Jones, D. C. 1992. The Viability of Employee-Owned Firms: Evidence from France. *Industrial and Labor Relations Review*, 45.
- Fakhfakh, F., Perotin, V., & Gago, M. 2012. Productivity, Capital, and Labor in Labor-Managed and Conventional Firms: An Investigation on French Data. *ILR Review*, 65(4).
- Fontanari, E. 2018. Sottocapitalizzate e bisognose di finanza? in Borzaga, C. (ed.), *Cooperative da riscoprire: Dieci tesi controcorrente*. Roma: Donzelli editore, 25-58.
- Fontanari, E. & Borzaga, C. 2018. Cooperatives and taxation: how many benefits do they really have? The Italian case. Paper presented at 2018 ICA Conference 'Cooperatives in a rapidly changing world: Innovation in Enterprise and Community', 4-6 July 2018. Wageningen, Netherlands.
- Furubotn, E. G., & Pejovich, S. 1970. Property rights and the behaviour of the firm in a socialist state: the example of Yugoslavia. *Zeitschrift für Nationalökonomie*, 30, 431 - 454.
- Gagilardi, F. 2009. Financial development and the growth of cooperative firms. *Small Business Economics*, 32(4).
- George, D. A. R. 1993a. *Economic Democracy: The Political Economy of Self-Management and Participation*. London: Macmillan.
- George, D. A. R. 1993b. Ownership, Control and Self-Management. *International Review of Applied Economics*, 7.
- Istat 2019, *Struttura e performance delle cooperative italiane Anno 2015*. Rapporto di ricerca. Roma: Istat.
- Jensen, Michael, and Meckling, William H 1979. Rights and Production Functions: An Application to Labor-Managed Firms and Codetermination. *The Journal of Business*, 52(4): 469-506.

- Jones, Derek C. 2007. The productive efficiency of Italian producer cooperatives: Evidence from conventional and cooperative firms. In Sonja Novkovic and Vania Sena (Eds.), *Advances in the Economic Analysis of Participatory and Labor-Managed Firms, Cooperative Firms in Global Markets: Incidence, Viability and Economic Performance*, Vol. 9, pp. 3–28. Oxford: Elsevier Science.
- Jones, D., & Backus, D. 1977. British producer cooperatives in the footwear industry. *Economic Journal*, 87, 488-510.
- Major, Guy 1996, "Solving the Underinvestment and Degeneration Problems of Workers' Cooperatives," *Annals of Public and Cooperative Economics*, 67(4), 545-601.
- McCain R. A. 1977, On the Optimum Financial Environment for Worker Cooperatives, *Zeitschrift für Nationalökonomie*, vol. 37, no. 3-4, pp. 355-384.
- Meade, J. E. 1972. The Theory of Labour-Managed Firms and of Profit Sharing. *The Economic Journal*, 82(325), 402-428.
- Meade, J. E. 1986. *Alternative Systems of Business Organisation and of Workers' Remuneration*. London: Allen and Unwin.
- Modigliani F. and Miller M. 1958. The Cost of Capital, Corporation Finance, and The Theory of Investment. *American Economic Review* 48(3), 261-297.
- Navarra, Cecilia and Tortia, Ermanno 2014. Employer moral hazard, wage rigidity, and worker cooperatives: A theoretical appraisal. *Journal of Economic Issues*, 48(3), 707-726.
- Ostrom, E. 1990. *Governing the Commons. The Evolution of Institutions for Collective Action*. Cambridge, UK: Cambridge University Press.
- Pencavel, John, and Ben Craig. 1994. The empirical performance of orthodox models of the firm: Conventional firms and worker cooperatives. *Journal of Political Economy* 102(4): 718–44.
- Pencavel, J., Pistaferri, L., & Schivardi, F. (2006). Wages, Employment and Capital in Capitalist and Worker-Owned Firms. *Industrial and Labor Relations Review*, 60(1).
- Podivinsky, Jan M., and Geoff Stewart, 2006. Why is labour-managed firm entry so rare? An analysis of UK manufacturing data. *Journal of Economic Behavior & Organization* 63(1), 177–192.
- Prendergast, Canice, 1999. The Provision of Incentives in Firms. *Journal of Economic Literature*, 37(1): 7-63.
- Putterman, Louis, 1988, The firm as association versus the firm as commodity: Efficiency, rights, and ownership, *Economics and Philosophy* 4(2), 243–266.
- Schlicht, Ekkehart and von Weizsäcker, Carl Christian, 1977, Risk financing in labour managed economies: The commitment problem, *Zeitschrift für die gesamte Staatswissenschaft* 133, special issue, 53–66.
- Tortia, E.C. 2003. Property Rights, Distribution of Value Added, and Accumulation of Capital in Labour Managed Firms. *Economia Politica*.
- Tortia, E.C., 2007. Self-financing in labour-managed firms (LMFs): individual capital accounts and bonds. *Advances in the Economic Analysis of Participatory & Labor-Managed Firms*, 10, 233-261.

- Tortia, E.C., 2018. The Firm as a Common. Non-Divided Ownership, Patrimonial Stability and Longevity of Co-Operative Enterprises. *Sustainability* 10(4), 1023; DOI: <https://doi.org/10.3390/su10041023>
- van der Weerden, Victor 2016. Financing difficulties in the Labor-Managed Firm. Master Dissertation. Erasmus University Rotterdam. Online: <https://pdfs.semanticscholar.org/0cce/1789bce26e14deb5eddf3e9c3c8bf6757101.pdf> [Accessed 10 October 2019]
- Vanek, J. 1970. *The General Theory of Labour-Managed Market Economies*. Ithaca: Cornell University Press.
- Vanek, J. 1977. Some fundamental considerations on financing and the form of ownership under labour management. In J. Vanek, *The Labour-Managed Economy: Essays by Jaroslav Vanek*. Ithaca: Cornell University Press.
- Ward, B. 1958. The firm in Illyria: market syndicalism. *American Economic Review*, 48, 566-589.